Notice of Allowability	Application No.	Applicant(s)	
	09/922,219	KELLER ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment of November 21, 2003*.
2. ☒ The allowed claim(s) is/are *17-40*.
3. ☒ The drawings filed on *03 August 2001* are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.
5. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
   (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
8. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No. ____.
   (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
   (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the margin according to 37 CFR 1.121(d).
9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1☒ Notice of References Cited (PTO-892)
2☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No. All
4☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5☐ Notice of Informal Patent Application (PTO-152)
6☒ Interview Summary (PTO-413), Paper No._____ .
7☒ Examiner's Amendment/Comment
8☒ Examiner's Statement of Reasons for Allowance
9☐ Other .

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview and fax transmission between Robert J. Stern and Rudy Zervigon on January 6, 2004. Refer to interview summary.

The application has been amended as follows:

1–16. (Canceled)

17. (Previously presented): A method of minimizing thermal stress on a gas distribution plate through which gas is dispensed into the interior of a plasma chamber, comprising the steps of:

providing a plasma chamber having an interior;

mounting an inlet manifold top wall within the chamber;

providing one or more inlet manifold side wall segments, wherein each side wall segment includes an upper portion, a lower flange, and a sheet extending between the upper portion of that side wall segment and the lower flange of that side wall segment;

mounting the upper portion of each segment of the inlet manifold side wall to the inlet manifold top wall so as to position the segments of the inlet manifold side wall so that they collectively encircle an inlet manifold region within the plasma chamber;

providing a gas distribution plate perforated by a number of gas outlet orifices;

mounting the lower flange of each side wall segment to the gas distribution plate so that the gas distribution plate is spaced away from the inlet manifold top wall, wherein the inlet manifold top wall, the inlet manifold side wall segments, and the gas distribution plate collectively enclose said inlet manifold region; and

supplying a gas through a gas inlet orifice in the inlet manifold top wall so that the gas flows into the inlet manifold region and then flows through the gas outlet orifices into the interior of the plasma chamber.

18. (Previously presented): A method according to claim 17, further comprising the step of:

maintaining a plasma within the interior of the plasma chamber;

wherein the step of providing the inlet manifold side wall segments includes the step of providing each sheet with a thickness sufficiently small, and a height sufficiently large, so as to produce a substantial temperature differential between the inlet manifold top wall and the gas distribution plate in response to heat transferred from the plasma to the gas distribution plate.

19. (Previously presented): A method according to claim 17, futher comprising the step of:

maintaining a plasma within the interior of the plasma chamber;

wherein the step of providing the inlet manifold side wall segments includes the step of providing each sheet with a thickness sufficiently small, and a height sufficiently large, so as to produce a temperature differential of at least 100 degrees C between the inlet manifold top wall and the gas distribution plate in response to heat transferred from the plasma to the gas distribution plate.

20. (Previously presented): A method according to claim 17, wherein the step of providing the inlet manifold side wall segments includes the step of:

providing each sheet with a flexibility sufficient so that no substantial force is required to bend the sheet by an amount sufficient to permit the gas distribution plate to expand by at least one percent.

21. (Previously presented): A method according to claim 17, wherein:

the inlet manifold top wall has a surface facing the gas distribution plate that is generally rectangular with four sides;

the gas distribution plate has a surface facing the top wall that is generally rectangular with four sides;

the step of providing the inlet manifold side wall segments comprises providing four of said side wall segments wherein the sheet of each of the four side wall segments is generally rectangular; and

the step of mounting the lower flange of each side wall segment comprises mounting each flange so that the sheet of each of the four side wall segments extends between a corresponding one of the four sides of said surface of the top wall and a corresponding one of the four sides of said surface of the gas distribution plate.

22. (Previously presented): A method according to claim 17, wherein:

the gas distribution plate has one or more grooves in its perimeter; and

the step of mounting the lower flange of each side wall segment comprises mounting each such flange so as to extend into one of said grooves.

23. (Currently amended): A method according to claim 17, wherein:

the gas distribution plate further comprises

a lip extending radially outward from the perimeter of the gas distribution plate, and

a plurality of pins attached to, and extending downward from, the lip of the gas

distribution plate;

the lower flange of each side wall segment is perforated by a plurality of holes;

the step of mounting the lower flange of each side wall segment comprises mounting each flange to the gas distribution plate so that each of said pins extends through a corresponding one of said holes; and

each hole ~~is~~ has a width that exceeds the width of its corresponding pin so as to permit relative movement between each lower flange and the gas distribution plate.

24. (Previously presented): A method according to claim 17, wherein:

the sheet of each side wall segment is flexible so as to permit movement of the lower flange of that side wall segment in a direction perpendicular to the sheet; and

for each side wall segment, each hole in the lower flange of that side wall segment has a long axis parallel to the sheet of that side wall segment.

25 (Previously presented): A method according to claim 17, wherein:

the width of each hole along one axis of the hole exceeds the width of its corresponding pin along said axis by an amount sufficient to permit an amount of relative movement between each lower flange and the gas distribution plate that exceeds the maximum likely relative differential thermal expansion between the lower flange and the gas distribution plate during operation of the plasma chamber.

26. (Previously presented): A method according to claim 17, wherein:

the width of each hole along one axis of the hole exceeds the width of its corresponding pin along said axis by at least 0.03 inch.

27. (Previously presented): A method according to claim 17, wherein:

the width of each hole along one axis of the hole exceeds the width of its corresponding pin along said axis by at least 0.1% of the widest dimension of the gas distribution plate.

28. (Previously presented): A method according to claim 17, wherein:

said one or more side wall segments include first and second side wall segments; and

the method further comprises the steps of:

positioning an edge of the sheet of the first side wall segment and an edge of the sheet of the second side wall segment so as to be adjacent, parallel, and separated by a gap; and

mounting a post radially outward of the gap and sufficiently close to the gap so as to impede the flow of gas through the gap.

29. (Previously presented): A method according to claim 17, wherein:

the step of providing one or more side wall segments includes providing first and second side wall segments;

the sheet of the first side wall segment is bent at a first angle along a first vertical vertex line so that: (i) a first end area of the sheet extends between the first vertex line and an edge of the sheet, and (ii) a first central area of the sheet lies on the opposite side of the first vertex line;

the sheet of the second side wall segment is bent at a second angle along a second vertical vertex line so that: (i) a second end area of the sheet extends between the second vertex line and an edge of the sheet, and (ii) a second central area of the sheet lies on the opposite side of the second vertex line;

the method further comprises the step of positioning said edge of the sheet of the first side wall segment and said edge of the sheet of the second side wall segment so as to be adjacent, parallel and separated by a gap; and

the first and second angles are established so that the first and second end areas are coplanar and are separated only by said gap.

30. (Previously presented): A method according to claim 29, wherein both the first angle and the second angle are 45 degrees.

31. (Previously presented): A method according to claim 29, further comprising the step of mounting a post radially outward of the gap, wherein:

the post extends vertically along the entire length of the gap;

the post extends laterally so as to overlie the first end area, the second end area, a portion of the first central area adjoining the first vertex line, and a portion of the second central area adjoining the second vertex line; and

the post is positioned sufficiently close to said portions of the first and second areas, and said portions of the first and second areas are sufficiently large, so that the post impedes gas within the inlet

manifold from flowing through the gap.

32. (Previously presented): A method of minimizing spatial variation in temperature of a gas distribution plate through which gas is dispensed into the interior of a plasma chamber, comprising the steps of:

providing a plasma chamber having an interior;

mounting an inlet manifold top wall within the chamber;

providing an inlet manifold side wall including one or more side wall segments, wherein each side wall segment includes an upper portion, a lower flange, and a sheet extending between the upper portion of that side wall segment and the lower flange of that side wall segment;

mounting the upper portion of each side wall segment to the inlet manifold top wall so as to position the side wall segments so that they collectively encircle an inlet manifold region within the plasma chamber;

providing a gas distribution plate perforated by a number of gas outlet orifices;

mounting the lower flange of each side wall segment to the gas distribution plate so that the gas distribution plate is spaced away from the top wall, wherein the inlet manifold top wall, the inlet manifold side wall segments, and the gas distribution plate collectively enclose said inlet manifold region; and

supplying a gas through a gas inlet orifice in the inlet manifold top wall so that the gas flows into the inlet manifold region and then flows through the gas outlet orifices into the interior of the plasma chamber; and

providing a plasma with the chamber;

wherein the inlet manifold side wall interposes a sufficiently high thermal resistance between the inlet manifold top wall and the gas distribution plate so that, during operation of the plasma chamber, the gas distribution plate has a spatial variation in temperature no greater than 50 degrees C.

33. (Previously presented): A method according to claim 32, wherein said spatial variation in temperature is no greater than 10 degrees C.

34. (Previously presented): A method of minimizing the difference in temperature between a workpiece support pedestal and a gas distribution plate through which gas is dispensed into the interior of a plasma chamber, comprising the steps of:

supporting a substrate on a pedestal within the plasma chamber;

heating the pedestal;

mounting an inlet manifold top wall within the chamber;

providing an inlet manifold side wall including one or more side wall segments, wherein each side wall segment includes an upper portion, a lower flange, and a sheet extending between the upper portion of that side wall segment and the lower flange of that side wall segment;

mounting the upper portion of each side wall segment to the inlet manifold top wall so as to position the side wall segments so that they collectively encircle an inlet manifold region within the plasma chamber;

providing a gas distribution plate perforated by a number of gas outlet orifices;

mounting the lower flange of each side wall segment to the gas distribution plate so that the gas distribution plate is spaced away from the top wall, wherein the inlet manifold top wall, the inlet manifold side wall segments, and the gas distribution plate collectively enclose said inlet manifold region; and

supplying a gas through a gas inlet orifice in the inlet manifold top wall so that the gas flows into the inlet manifold region and then flows through the gas outlet orifices into the interior of the plasma chamber; and

providing a plasma with the chamber;

wherein the inlet manifold side wall interposes a sufficiently high thermal resistance between the inlet manifold top wall and the gas distribution plate so that, during the steps of heating the pedestal and providing a plasma within the chamber, there is a temperature difference between the pedestal and the upper surface of the substrate no greater than 50 degrees C.

35. (Previously presented): A method according to claim 34, wherein said temperature difference is no greater than 25 degrees C.

36. (New): A method according to claim 17, wherein the step of providing the inlet manifold side wall segments includes the step of:

providing each sheet with a thickness less than 3 millimeters.

37. (New): A method according to claim 17, wherein the step of providing the inlet manifold side wall segments includes the step of:

providing each sheet with a thickness less than 1 millimeter.

38. (New): A method according to claim 17, wherein the step of providing the inlet manifold side wall segments includes the step of:

providing each sheet with a flexibility sufficient to permit each sheet to bend at least 6.3 degrees.

39. (New): A method according to claim 17, further comprising the steps of:

positioning a workpiece within the interior of the plasma chamber; and

maintaining a plasma within the interior of the plasma chamber;

wherein the step of providing the gas distribution plate includes the step of providing the gas distribution plate with a surface facing the workpiece; and

wherein the step of providing the inlet manifold side wall segments includes the step of providing each sheet with a flexibility sufficient so as to prevent the flatness of said surface of the gas distribution plate from being distorted by more than 25 microns in response to heat from the plasma.

40. (New): A method according to claim 17, further comprising the steps of:

positioning a workpiece within the interior of the plasma chamber; and

maintaining a plasma within the interior of the plasma chamber;

wherein the step of providing the gas distribution plate includes the step of providing the gas distribution plate with a surface facing the workpiece; and

wherein the step of providing the inlet manifold side wall segments includes the step of providing each sheet with a flexibility sufficient so as to prevent the flatness of said surface of the gas distribution plate from being distorted by more than 10 microns in response to heat from the plasma.

Allowable Subject Matter

2. Claims 17-40 are allowed.

3. The following is an examiner's statement of reasons for allowance: The search of the prior art has produced Vanell et al (USPat. 5,647,911), Zhao, Jun et al (USPat. 5,994,678 – Fig.13), and Szapucki et al (USPat. 6,170,432) as the closest prior art. The claimed invention of the present application requires "side wall segments" fitted between a plasma chamber top wall and showerhead by the patently distinguishing manner of, for example, "mounting the lower flange of each side wall segment to the gas distribution plate". None of the cited prior art teach

or fairly suggest such "side wall segments" effecting thermal stress minimization where said "side wall segments" have a "lower flange" and "upper portion" as claimed (claim 17).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. USPat. 6,302,057; 5,647,911; 6,477,980; 5,567,243; 6,527,908; 6,170,432; 6,364,949; 6,254,742; 5,628,829; 5,994,678.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272.1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 872-9311. The official before final fax phone number for the 1763 art unit is (703) 872-9310. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (571) 272-1439.

JEFFRIE R. LUND
PRIMARY EXAMINER